

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Andreas V. Bechtolsheim and David R. Cheriton
Assignee: Cisco Technology, Inc.
Title: ACCESS CONTROL LIST PROCESSING IN HARDWARE
Parent Serial No.: 09/108,071 Parent Filing Date: June 30, 1998
Prior Examiner: Frank Duong Prior Group Art Unit: 2664
Docket No.: M-9255-1C US Client Ref. No.: Sequence No. 5826

San Jose, California
March 1, 2002

BOX PATENT APPLICATION
COMMISSIONER FOR PATENTS
Washington, D. C. 20231

PRELIMINARY AMENDMENT

Dear Sir:

Prior to examining this patent application, please enter the following amendments and consider the following remarks.

In the Claims

Please cancel claims 1-31 without prejudice or disclaimer of the subject matter recited therein.

LAW OFFICES OF
SKJERVEN MORRILL
MACPHERSON LLP

25 METRO DRIVE
SUITE 700
SAN JOSE, CA 95110
(408) 453-9200
FAX (408) 453-7979

Please add the following claims:

32. A method of processing a packet comprising:
matching one or more characteristics of said packet with one or more access control
specifiers in at least one access control element; and
processing said packet based on said matching.

33. The method of claim 32, wherein said access control element is a content
addressable memory.

34. The method of claim 32, wherein said matching and said processing is done in
parallel.

35. The method of claim 32, wherein said characteristics of said packet comprises
one or more of a source address, a destination address, a source port, a destination port, a
protocol type, an input interface and an output interface.

36. The method of claim 32, wherein said characteristics of said packet comprises
data carried by said packet in a packet header.

37. The method of claim 32, further comprising:
receiving said packet.

38. The method of claim 32, further comprising:
identifying one or more of said access control specifiers based on said matching.

39. The method of claim 37, further comprising:
prioritizing said one or more of said access control specifiers identified based on said
matching to generate a set of prioritized access control specifiers.

40. The method of claim 39, wherein said prioritizing is done in parallel by a
priority encoder.

LAW OFFICES OF
SKJERVEN MORRILL
MACPHERSON LLP

25 METRO DRIVE
SUITE 700
SAN JOSE, CA 95110
(408) 453-9200
FAX (408) 453-7979

41. The method of claim 39, wherein said prioritizing is done based on an address of said access control specifiers in said access control element.

42. The method of claim 39, wherein said processing is done based on said set of prioritized access control specifiers.

43. The method of claim 32, wherein said processing further comprising:
if said packet requires processing by a higher-level processor,
forwarding said packet to said higher-level processor.

44. The method of claim 32, further comprising:
if said packet requires dropping,
dropping said packet.

45. The method of claim 32, further comprising:
if said packet requires forwarding,
forwarding said packet.

46. A system for processing a packet comprising:
an access control element, wherein said access control element is configured to store
one or more access control specifiers; and
a priority encoder coupled to said access control element, wherein said priority
encoder is configured to prioritize in parallel said one or more access control
specifiers matched with one or more characteristics of said packet.

47. The system of claim 46, wherein said priority encoder is further configured to
prioritize said one or more access control specifiers matched with said one or more
characteristics of said packet according to an address of said one or more
access control specifiers in said access control element.

LAW OFFICES OF
SKJERVEN MORRILL
MACPHERSON LLP

25 METRO DRIVE
SUITE 700
SAN JOSE, CA 95110
(408) 453-9200
FAX (408) 453-7979

48. The system of claim 46, further comprising:
a compare unit coupled to said access control unit, wherein said compare unit is
configured to compare said one or more characteristics of said packet with one
or more values.

49. The system of claim 48, wherein said one or more values are predetermined.

50. The system of claim 48, wherein said one or more values are dynamically
determined.

51. The system of claim 48, wherein said compare unit is further configured to
perform arithmetic operation on data carried by said packet in a packet header.

52. The system of claim 48, wherein said compare unit is further configured to
perform logical operation on said data carried by said packet in said packet header.

53. The system of claim 46, wherein said access control element further
comprising:
an access control memory.

54. The system of claim 53, wherein said access control memory is a content-
addressable memory.

55. The method of claim 53, wherein said access control memory stores at least
one of said access control specifier.

56. The system of claim 53, wherein said access control specifier further
comprising:
a label match mask configured to determine whether a first corresponding bit of said
one or more characteristics of said packet is tested; and
a label match pattern, wherein said label match pattern is compared with a second
corresponding bit of said one or more characteristics of said packet.

57. The system of claim 46, further comprising:

a processor, coupled to said access control element, said processor is configured to process said packet when said packet is not processed by said access control element.

58. The system of claim 46, further comprising:

at least one input port coupled to said access control element, wherein said input port is configured to receive said packet; and

at least one output port coupled to said access control element, wherein said packet is forwarded via said out put port.

59. A system for processing a packet comprising:

means for matching one or more characteristics of said packet with one or more access control specifiers in at least one access control element; and

means for processing said packet based on said matching.

60. The system of claim 59, wherein said access control element is a content addressable memory.

61. The system of claim 59, wherein said matching and said processing is done in parallel.

62. The system of claim 59, wherein said characteristics of said packet comprises one or more of a source address, a destination address, a source port, a destination port, a protocol type, an input interface and an output interface.

63. The system of claim 59, wherein said characteristics of said packet comprises data carried by said packet in a packet header.

64. The system of claim 59, further comprising:

means for receiving said packet.

65. The system of claim 59, further comprising:
means for identifying one or more of said access control specifiers based on said matching.

66. The system of claim 64, further comprising:
means for prioritizing said one or more of said access control specifiers identified based on said matching to generate a set of prioritized access control specifiers.

67. The system of claim 66, wherein said prioritizing is done in parallel by a priority encoder.

68. The system of claim 66, wherein said prioritizing is done based on an address of said access control specifiers in said access control element.

69. The system of claim 66, wherein said processing is done based on said set of prioritized access control specifiers.

70. The system of claim 59, wherein said processing further comprising:
means for forwarding said packet to said higher-level processor if said packet requires processing by a higher-level processor.

71. The system of claim 59, further comprising:
means for dropping said packet if said packet requires dropping.

72. The system of claim 59, further comprising:
means for forwarding said packet if said packet requires forwarding.

LAW OFFICES OF
SKJERVEN MORRILL
MACPHERSON LLP

25 METRO DRIVE
SUITE 700
SAN JOSE, CA 95110
(408) 453-9200
FAX (408) 453-7979

73. A system comprising:
means for maintaining a set of access control patterns in at least one associative memory;
means for receiving a packet label responsible to a packet, said packet label being sufficient to perform access control processing for said packet;
means for matching matchable information, said matchable information being responsible to said packet label, with said set of access control patterns in parallel;
means for generating a set of matches in response thereto, each said match having priority information associated therewith;
means for selecting at least one of said matches in response to said priority information, and generating an access result in response to said at least one selected match; and
means for making a routing decision in response to said access result.

74. The system of claim 73 further comprising:
means for choosing a first one of said matches.

75. The system of claim 73, further comprising:
means for determining an output interface for said packet.

76. The system of claim 73, further comprising:
means for implementing a quality of service policy.

77. The system of claim 73, further comprising:
means for permitting or denying access for said packet.

78. The system of claim 73, further comprising:
means for making a preliminary routing decision for said packet.

79. The method of claim 73, further comprising:
means for determining at least one output interface for said packet.

80. The system of claim 73, further comprising:
means for preprocessing said packet label; and
means for generating said matchable information.

81. The system of claim 79, further comprising:
means for performing one or more of an arithmetic, logical, and comparison operation
on said packet label; and
means for generating a bit string for said matchable information in response to said
arithmetic, logical, and comparison operation.

82. The system of claim 73, further comprising:
means for comparing a field of said packet label with an arithmetic range or mask
value.

83. The system of claim 73, further comprising:
means for comparing a source IP port value or a destination IP port value with a
selected port value.

84. The system of claim 32, further comprising:
means for postprocessing said selected match to generate said access result.

85. The system of claim 73, further comprising:
means for accessing a memory in response to a bitstring included in said selected
match.

86. The system of claim 73, further comprising:
means for declaring whether to permit or deny access of a set of packets.

87. The system of claim 73, further comprising:
means for receiving said sequence of access control specifiers;
means for translating said sequence of access control specifiers into said sequence of
access control patterns; and
means for storing said sequence of access control patterns in said associative memory.

88. The system of claim 73, further comprising:
means for generating a single one of said access control patterns in response to a
plurality of said access control specifiers.

89. The system of claim 73, further comprising:
means for generating a single one of said access control patterns in response to a
plurality of said access control specifiers.

ALL INFORMATION CONTAINED
HEREIN IS UNCLASSIFIED
DATE 08-10-2001 BY 60322
UCBAW/STP

LAW OFFICES OF
SKJERVEN MORRILL
MACPHERSON LLP

25 METRO DRIVE
SUITE 700
SAN JOSE, CA 95110
(408) 453-9200
FAX (408) 453-7979

REMARKS/CONCLUSION

In view of the amendments and remarks set forth herein, the application is believed to be in condition for allowance and a notice to that effect is solicited. In light of the foregoing amendments and remarks, applicants submit that all claims are now in condition for allowance, and an early notice to that effect is earnestly solicited. Nonetheless, should any issues remain that might be subject to resolution through a telephonic interview, the Examiner is requested to telephone the undersigned.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version With Markings To Show Changes Made."

EXPRESS MAIL LABEL NO:

EV 047 534 011 US

Respectfully submitted,



Abdul R. Zindani
Attorney for Applicant
Reg. No. 46,091

LAW OFFICES OF
SKJERVEN MORRILL
MACPHERSON LLP

25 METRO DRIVE
SUITE 700
SAN JOSE, CA 95110
(408) 453-9200
FAX (408) 453-7979

VERSION WITH MARKINGS TO SHOW CHANGES MADE

Claims 1-31 were cancelled.

32. A method of processing a packet comprising:
matching one or more characteristics of said packet with one or more access control
specifiers in at least one access control element; and
processing said packet based on said matching.

33. The method of claim 32, wherein said access control element is a content
addressable memory.

34. The method of claim 32, wherein said matching and said processing is done in
parallel.

35. The method of claim 32, wherein said characteristics of said packet comprises
one or more of a source address, a destination address, a source port, a destination port, a
protocol type, an input interface and an output interface.

36. The method of claim 32, wherein said characteristics of said packet comprises
data carried by said packet in a packet header.

37. The method of claim 32, further comprising:
receiving said packet.

38. The method of claim 32, further comprising:
identifying one or more of said access control specifiers based on said matching.

39. The method of claim 37, further comprising:
prioritizing said one or more of said access control specifiers identified based on said
matching to generate a set of prioritized access control specifiers.

40. The method of claim 39, wherein said prioritizing is done in parallel by a
priority encoder.

41. The method of claim 39, wherein said prioritizing is done based on an address of said access control specifiers in said access control element.

42. The method of claim 39, wherein said processing is done based on said set of prioritized access control specifiers.

43. The method of claim 32, wherein said processing further comprising:
if said packet requires processing by a higher-level processor,
forwarding said packet to said higher-level processor.

44. The method of claim 32, further comprising:
if said packet requires dropping,
dropping said packet.

45. The method of claim 32, further comprising:
if said packet requires forwarding,
forwarding said packet.

46. A system for processing a packet comprising:
an access control element, wherein said access control element is configured to store
one or more access control specifiers; and
a priority encoder coupled to said access control element, wherein said priority
encoder is configured to prioritize in parallel said one or more access control
specifiers matched with one or more characteristics of said packet.

47. The system of claim 46, wherein said priority encoder is further configured to
prioritize said one or more access control specifiers matched with said one or more
characteristics of said packet according to an address of said one or more
access control specifiers in said access control element.

LAW OFFICES OF
SKJERVEN MORRILL
MACPHERSON LLP

25 METRO DRIVE
SUITE 700
SAN JOSE, CA 95110
(408) 453-9200
FAX (408) 453-7979

48. The system of claim 46, further comprising:

a compare unit coupled to said access control unit, wherein said compare unit is configured to compare said one or more characteristics of said packet with one or more values.

49. The system of claim 48, wherein said one or more values are predetermined.

50. The system of claim 48, wherein said one or more values are dynamically determined.

51. The system of claim 48, wherein said compare unit is further configured to perform arithmetic operation on data carried by said packet in a packet header.

52. The system of claim 48, wherein said compare unit is further configured to perform logical operation on said data carried by said packet in said packet header.

53. The system of claim 46, wherein said access control element further comprising:
an access control memory.

54. The system of claim 53, wherein said access control memory is a content-addressable memory.

55. The method of claim 53, wherein said access control memory stores at least one of said access control specifier.

56. The system of claim 53, wherein said access control specifier further comprising:

a label match mask configured to determine whether a first corresponding bit of said one or more characteristics of said packet is tested; and
a label match pattern, wherein said label match pattern is compared with a second corresponding bit of said one or more characteristics of said packet.

57. The system of claim 46, further comprising:

a processor, coupled to said access control element, said processor is configured to process said packet when said packet is not processed by said access control element.

58. The system of claim 46, further comprising:

at least one input port coupled to said access control element, wherein said input port is configured to receive said packet; and
at least one output port coupled to said access control element, wherein said packet is forwarded via said out put port.

59. A system for processing a packet comprising:

means for matching one or more characteristics of said packet with one or more access control specifiers in at least one access control element; and
means for processing said packet based on said matching.

60. The system of claim 59, wherein said access control element is a content addressable memory.

61. The system of claim 59, wherein said matching and said processing is done in parallel.

62. The system of claim 59, wherein said characteristics of said packet comprises one or more of a source address, a destination address, a source port, a destination port, a protocol type, an input interface and an output interface.

63. The system of claim 59, wherein said characteristics of said packet comprises data carried by said packet in a packet header.

64. The system of claim 59, further comprising:

means for receiving said packet.

65. The system of claim 59, further comprising:
means for identifying one or more of said access control specifiers based on said
matching.

66. The system of claim 64, further comprising:
means for prioritizing said one or more of said access control specifiers identified
based on said matching to generate a set of prioritized access control specifiers.

67. The system of claim 66, wherein said prioritizing is done in parallel by a
priority encoder.

68. The system of claim 66, wherein said prioritizing is done based on an address
of said access control specifiers in said access control element.

69. The system of claim 66, wherein said processing is done based on said set of
prioritized access control specifiers.

70. The system of claim 59, wherein said processing further comprising:
means for forwarding said packet to said higher-level processor if said packet requires
processing by a higher-level processor.

71. The system of claim 59, further comprising:
means for dropping said packet if said packet requires dropping.

72. The system of claim 59, further comprising:
means for forwarding said packet if said packet requires forwarding.

LAW OFFICES OF
SKJERVEN MORRILL
MACPHERSON LLP

25 METRO DRIVE
SUITE 700
SAN JOSE, CA 95110
(408) 453-9200
FAX (408) 453-7979

73. A system comprising:

means for maintaining a set of access control patterns in at least one associative memory;

means for receiving a packet label responsible to a packet, said packet label being sufficient to perform access control processing for said packet;

means for matching matchable information, said matchable information being responsible to said packet label, with said set of access control patterns in parallel;

means for generating a set of matches in response thereto, each said match having priority information associated therewith;

means for selecting at least one of said matches in response to said priority information, and generating an access result in response to said at least one selected match; and

means for making a routing decision in response to said access result.

74. The system of claim 73 further comprising:

means for choosing a first one of said matches.

75. The system of claim 73, further comprising:

means for determining an output interface for said packet.

76. The system of claim 73, further comprising:

means for implementing a quality of service policy.

77. The system of claim 73, further comprising:

means for permitting or denying access for said packet.

78. The system of claim 73, further comprising:

means for making a preliminary routing decision for said packet.

79. The method of claim 73, further comprising:

means for determining at least one output interface for said packet.

80. The system of claim 73, further comprising:

means for preprocessing said packet label; and

means for generating said matchable information.

81. The system of claim 79, further comprising:

means for performing one or more of an arithmetic, logical, and comparison operation
on said packet label; and

means for generating a bit string for said matchable information in response to said
arithmetic, logical, and comparison operation.

82. The system of claim 73, further comprising:

means for comparing a field of said packet label with an arithmetic range or mask
value.

83. The system of claim 73, further comprising:

means for comparing a source IP port value or a destination IP port value with a
selected port value.

84. The system of claim 32, further comprising:

means for postprocessing said selected match to generate said access result.

85. The system of claim 73, further comprising:

means for accessing a memory in response to a bitstring included in said selected
match.

86. The system of claim 73, further comprising:

means for declaring whether to permit or deny access of a set of packets.

87. The system of claim 73, further comprising:

means for receiving said sequence of access control specifiers;

means for translating said sequence of access control specifiers into said sequence of
access control patterns; and

means for storing said sequence of access control patterns in said associative memory.

88. The system of claim 73, further comprising:

means for generating a single one of said access control patterns in response to a plurality of said access control specifiers.

89. The system of claim 73, further comprising:

means for generating a single one of said access control patterns in response to a plurality of said access control specifiers.

LAW OFFICES OF
SKJERVEN MORRILL
MACPHERSON LLP

25 METRO DRIVE
SUITE 700
SAN JOSE, CA 95110
(408) 453-9200
FAX (408) 453-7979